

Maine Department of Transportation

Memo

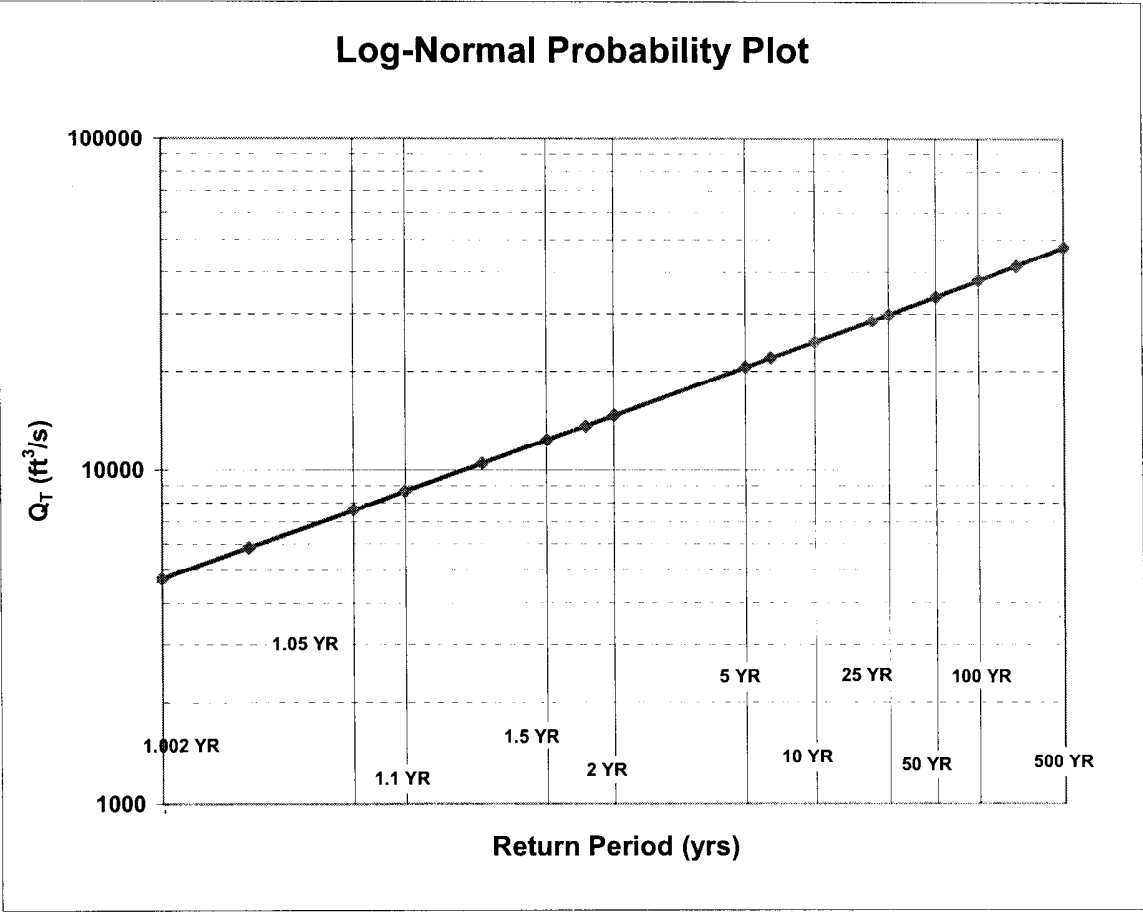
To: Mark Parlin
From: Charles Hebson
CC:
Date: 2 March 2012
Re: 18232 Limington Design Hydrology – Saco River, Steep Falls Bridge, #3328

The final recommended design hydrology is summarized in Table 1 and Figure 1 below.

Table 1. Design Hydrology Summary

Area (mi ²)	1351	1293	1330
NWI (%)	8.8	8.6	
Return Period	Final Recommended Q _T (ft ³ /s)	USGS @ Cornish (1917-2010)	FEMA @ Bridge (1981)
1.1	8650	8208	
1.5	12320	11470	
2	14627	13766	
5	20491	19330	
10	24528	23157	23600
25	29741	28123	
50	33705	31902	34600
100	37735	35743	39800
500	47416	44977	53800

Figure 1. Probability Plot – Saco River, Steep Falls Bridge



Discussion

We are fortunate that the project site is very close to the USGS Cornish flow gage (01066000); our watershed area is just 4.5% larger than the gaged area. Also, 1981 FEMA Flood Insurance Study evaluated peak flows on the Saco River at the Baldwin-Limington-Standish town line; this is essentially at our bridge location.

At ungaged sites we rely on regression estimates developed by USGS (Hodgkins, 1999). When a location is on a gaged river, we generally calculate a weighted average of regression estimate and gage flow values (Hodgkins, 1999, Section 4). Since our site is so close to the Cornish gage, our site estimates are weighted combination of the site regression estimate and the weighted gage estimates, according to Section 4. There is a second gage, at Buxton (01067000). Our bridge is much closer to Cornish ($A_{ws} = 1351 \text{ mi}^2$ vs $A_C = 1293 \text{ mi}^2$; 4.5% larger and 8.8 miles downstream) than Buxton ($A_B = 1571 \text{ mi}^2$; 16.3% smaller and 12.2 miles upstream). Also, the Buxton gage is located at the West Buxton dam and is 1.6 miles downstream of the Bonney Eagle dam; flow conditions at the bridge and the Cornish gage are more similar.

On gaged rivers we ordinarily extract peak flow estimates from Hodgkins (1999). However, that report only uses data through 1996; at this point there 14 years of additional peak flow data in the database. Therefore, we downloaded the complete annual peak flow record and did a standard "Bulletin 17B" flood frequency analysis using the USGS program PeakFQ (Flynn, et al, 2006) using the new generalized skew value developed for Maine (Hodgkins, 1999, p. 5). The station estimates from gage data for the probability distribution of annual peaks is given in Appendix A as "ANNUAL FREQUENCY CURVE -- DISCHARGES AT SELECTED EXCEEDANCE PROBABILITIES".

Final estimates points on the distribution curve are obtained by a weighted combination Q_w of station gage data estimates Q_g and regression estimates Q_r for gage watershed:

$$Q_w = (Q_g/n + Q_r/e)/(n+e)$$

where n = length of gage record (94 years) and e is the average equivalent years of record for the regression estimates. In other words, the regression estimate is "worth" or "equivalent to" e years of record. This parameter e varies according to the return period (Hodgkins, 1999, Table 3) and ranges between 1.82 yrs ($T = 2$ yrs) and 6.41 yrs ($T = 500$ yrs). By this calculation, the gage data estimate is given more weight as the record length increases. The final estimates for the Cornish gage are given in Table 1 above.

The estimates for our ungaged bridge site are calculated by combining standard site regression estimate and the area-scaled gage estimates in Table 1. The standard site regression equations Q_r are of the form

$$Q_r = cA^a10^{ww}$$

Where the parameters c , a , and w vary according to return period (Hodgkins, Table 3); A is watershed area and W is the percentage of watershed area that is mapped as NWI wetlands. The area A was determined in ArcGIS from available watershed delineations; the watershed map is shown in Figure 2. The NWI wetlands was interpolated between documented values at the Cornish and West Buxton USGS gages.

In addition to the site regression estimate, an independent site estimate is calculated from the gage estimates Q_w by simple area scaling:

$$Q_u = (A_u/A_g)^a Q_w$$

where a is the same area exponent in Q_r above.

The final weighted estimate for the ungaged site is calculated as

$$Q_{uf} = W_r Q_r + (1-W_r) Q_u$$

where W_r is the area weighting factor:

$$W_r = (A_u/A_g) - 1, \text{ for } A_u > A_g$$

$$W_r = (A_g/A_u) - 1, \text{ for } A_u < A_g$$

In our case, $A_u > A_g$ and $W_r = 0.044$. This indicates that in the final estimate, the scaled gage values will get most of the weight.

References:

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Flynn, K., W.H. Kirby, & P.R. Hummel, 2006. User's Manual for Program PeakFQ, Annual Flood Frequency Analysis Using Bulletin 17B Guidelines. US Geological Survey, *Techniques & Methods 4-B4*.

Figure 2. Saco River Watershed (with Subwatersheds) at Steep Falls Bridge



Appendix: Output for Saco River-Cornish Gage from PeakFQ

Program PeakFq	U. S. GEOLOGICAL SURVEY	Seq.000.000
Ver. 5.2	Annual peak flow frequency analysis	Run Date / Time
11/01/2007	following Bulletin 17-B Guidelines	02/24/2012 13:17

--- PROCESSING OPTIONS ---

Plot option = Graphics device
Basin char output = None
Print option = Yes
Debug print = No
Input peaks listing = Long
Input peaks format = WATSTORE peak file

Input files used:

peaks (ascii)- D:\PROGFILS\PEAKFQ\TEST\DATA_IN\SACO-CORNISH.TXT
specifications - PKFQWPSF.TMP

Output file(s):

main - D:\PROGFILS\PEAKFQ\TEST\DATA_IN\SACO-CORNISH.PRT

Program PeakFq	U. S. GEOLOGICAL SURVEY	Seq.001.001
Ver. 5.2	Annual peak flow frequency analysis	Run Date / Time
11/01/2007	following Bulletin 17-B Guidelines	02/24/2012 13:17

Station - 01066000 Saco River at Cornish, Maine

I N P U T D A T A S U M M A R Y

Number of peaks in record	=	94
Peaks not used in analysis	=	0
Systematic peaks in analysis	=	94
Historic peaks in analysis	=	0
Years of historic record	=	0
Generalized skew	=	0.029
Standard error	=	0.297
Mean Square error	=	0.088
Skew option	=	WEIGHTED
Gage base discharge	=	0.0
User supplied high outlier threshold	=	--
User supplied low outlier criterion	=	--
Plotting position parameter	=	0.00

***** NOTICE -- Preliminary machine computations. *****

***** User responsible for assessment and interpretation. *****

WCF134I-NO SYSTEMATIC PEAKS WERE BELOW GAGE BASE. 0.0

WCF195I-NO LOW OUTLIERS WERE DETECTED BELOW CRITERION. 4148.7

WCF162I-SYSTEMATIC PEAKS EXCEEDED HIGH-OUTLIER CRITERION. 1 44827.2

Program PeakFq	U. S. GEOLOGICAL SURVEY	Seq.001.002
Ver. 5.2	Annual peak flow frequency analysis	Run Date / Time
11/01/2007	following Bulletin 17-B Guidelines	02/24/2012 13:17

Station - 01066000 Saco River at Cornish, Maine

ANNUAL FREQUENCY CURVE PARAMETERS -- LOG-PEARSON TYPE III

	FLOOD BASE		LOGARITHMIC		
	EXCEEDANCE		STANDARD		
	DISCHARGE	PROBABILITY	MEAN	DEVIATION	SKEW
SYSTEMATIC RECORD	0.0	1.0000	4.1347	0.1725	0.031
BULL.17B ESTIMATE	0.0	1.0000	4.1347	0.1725	0.030

ANNUAL FREQUENCY CURVE -- DISCHARGES AT SELECTED EXCEEDANCE PROBABILITIES

ANNUAL			'EXPECTED	95-PCT CONFIDENCE LIMITS	
EXCEEDANCE	BULL.17B	SYSTEMATIC	PROBABILITY'	FOR BULL. 17B ESTIMATES	
PROBABILITY	ESTIMATE	RECORD	ESTIMATE	LOWER	UPPER
0.9950	4958.0	4959.0	4828.0	4241.0	5625.0
0.9900	5461.0	5462.0	5348.0	4726.0	6142.0
0.9500	7120.0	7120.0	7049.0	6352.0	7829.0
0.9000	8208.0	8208.0	8156.0	7430.0	8932.0
0.8000	9757.0	9756.0	9725.0	8968.0	10510.0

0.6667	11470.0	11470.0	11460.0	10660.0	12290.0
0.5000	13610.0	13610.0	13610.0	12720.0	14570.0
0.4292	14610.0	14610.0	14620.0	13660.0	15660.0
0.2000	19040.0	19040.0	19100.0	17680.0	20710.0
0.1000	22720.0	22720.0	22860.0	20870.0	25100.0
0.0400	27450.0	27450.0	27770.0	24860.0	30930.0
0.0200	31030.0	31040.0	31550.0	27820.0	35460.0
0.0100	34660.0	34670.0	35430.0	30770.0	40130.0
0.0050	38370.0	38380.0	39450.0	33740.0	44980.0
0.0020	43400.0	43420.0	45020.0	37730.0	51670.0

Program PeakFq	U. S. GEOLOGICAL SURVEY	Seq.001.003
Ver. 5.2	Annual peak flow frequency analysis	Run Date / Time
11/01/2007	following Bulletin 17-B Guidelines	02/24/2012 13:17

Station - 01066000 Saco River at Cornish, Maine

I N P U T D A T A L I S T I N G

WATER YEAR	DISCHARGE	CODES	WATER YEAR	DISCHARGE	CODES
1917	17600.0		1964	13400.0	
1918	7800.0		1965	5950.0	
1919	13500.0		1966	6140.0	
1920	14100.0		1967	7950.0	
1921	12600.0		1968	13800.0	
1922	18000.0		1969	25600.0	
1923	23000.0		1970	15500.0	
1924	12900.0		1971	14500.0	
1925	15900.0		1972	14800.0	
1926	12600.0		1973	17300.0	
1927	7800.0		1974	20000.0	
1928	13600.0		1975	9180.0	
1929	10800.0		1976	19200.0	
1930	9550.0		1977	12900.0	
1931	11700.0		1978	15500.0	
1932	13800.0		1979	18000.0	
1933	19500.0		1980	11800.0	
1934	14200.0		1981	17500.0	

1935	9570.0	1982	15900.0
1936	46600.0	1983	16100.0
1937	16900.0	1984	23300.0
1938	11900.0	1985	5310.0
1939	14100.0	1986	15400.0
1940	21500.0	1987	31300.0
1941	6290.0	1988	11300.0
1942	10200.0	1989	18300.0
1943	11900.0	1990	10200.0
1944	12100.0	1991	9330.0
1945	15800.0	1992	8300.0
1946	9460.0	1993	18200.0
1947	11400.0	1994	14900.0
1948	9870.0	1995	6450.0
1949	12600.0	1996	15400.0
1950	17100.0	1997	14800.0
1951	17100.0	1998	27500.0
1952	16900.0	1999	9810.0
1953	42400.0	2000	12700.0
1954	22800.0	2001	15800.0
1955	10900.0	2002	11700.0
1956	11600.0	2003	9110.0
1957	4550.0	2004	13800.0
1958	20200.0	2005	17100.0
1959	11700.0	2006	14900.0
1960	16800.0	2007	17000.0
1961	9550.0	2008	17700.0
1962	14200.0	2009	14100.0
1963	10900.0	2010	17600.0

Explanation of peak discharge qualification codes

PeakFQ NWIS

CODE CODE DEFINITION

D 3 Dam failure, non-recurrent flow anomaly

G 8 Discharge greater than stated value

X 3+8 Both of the above

L 4 Discharge less than stated value

K 6 OR C Known effect of regulation or urbanization

H 7 Historic peak

- Minus-flagged discharge -- Not used in computation

 -8888.0 -- No discharge value given

- Minus-flagged water year -- Historic peak used in computation

Program PeakFq	U. S. GEOLOGICAL SURVEY	Seq.001.004
Ver. 5.2	Annual peak flow frequency analysis	Run Date / Time
11/01/2007	following Bulletin 17-B Guidelines	02/24/2012 13:17

Station - 01066000 Saco River at Cornish, Maine

EMPIRICAL FREQUENCY CURVES -- WEIBULL PLOTTING POSITIONS

WATER YEAR	RANKED DISCHARGE	SYSTEMATIC RECORD	BULL.17B ESTIMATE
1936	46600.0	0.0105	0.0105
1953	42400.0	0.0211	0.0211
1987	31300.0	0.0316	0.0316
1998	27500.0	0.0421	0.0421
1969	25600.0	0.0526	0.0526
1984	23300.0	0.0632	0.0632
1923	23000.0	0.0737	0.0737
1954	22800.0	0.0842	0.0842
1940	21500.0	0.0947	0.0947
1958	20200.0	0.1053	0.1053
1974	20000.0	0.1158	0.1158
1933	19500.0	0.1263	0.1263
1976	19200.0	0.1368	0.1368
1989	18300.0	0.1474	0.1474
1993	18200.0	0.1579	0.1579
1922	18000.0	0.1684	0.1684
1979	18000.0	0.1789	0.1789
2008	17700.0	0.1895	0.1895

1917	17600.0	0.2000	0.2000
2010	17600.0	0.2105	0.2105
1981	17500.0	0.2211	0.2211
1973	17300.0	0.2316	0.2316
1950	17100.0	0.2421	0.2421
1951	17100.0	0.2526	0.2526
2005	17100.0	0.2632	0.2632
2007	17000.0	0.2737	0.2737
1937	16900.0	0.2842	0.2842
1952	16900.0	0.2947	0.2947
1960	16800.0	0.3053	0.3053
1983	16100.0	0.3158	0.3158
1925	15900.0	0.3263	0.3263
1982	15900.0	0.3368	0.3368
1945	15800.0	0.3474	0.3474
2001	15800.0	0.3579	0.3579
1970	15500.0	0.3684	0.3684
1978	15500.0	0.3789	0.3789
1986	15400.0	0.3895	0.3895
1996	15400.0	0.4000	0.4000
1994	14900.0	0.4105	0.4105
2006	14900.0	0.4211	0.4211
1972	14800.0	0.4316	0.4316
1997	14800.0	0.4421	0.4421
1971	14500.0	0.4526	0.4526
1934	14200.0	0.4632	0.4632
1962	14200.0	0.4737	0.4737
1920	14100.0	0.4842	0.4842
1939	14100.0	0.4947	0.4947
2009	14100.0	0.5053	0.5053

1932	13800.0	0.5158	0.5158
1968	13800.0	0.5263	0.5263
2004	13800.0	0.5368	0.5368
1928	13600.0	0.5474	0.5474
1919	13500.0	0.5579	0.5579
1964	13400.0	0.5684	0.5684
1924	12900.0	0.5789	0.5789
1977	12900.0	0.5895	0.5895
2000	12700.0	0.6000	0.6000
1921	12600.0	0.6105	0.6105
1926	12600.0	0.6211	0.6211
1949	12600.0	0.6316	0.6316
1944	12100.0	0.6421	0.6421
1938	11900.0	0.6526	0.6526
1943	11900.0	0.6632	0.6632
1980	11800.0	0.6737	0.6737
1931	11700.0	0.6842	0.6842
1959	11700.0	0.6947	0.6947
2002	11700.0	0.7053	0.7053
1956	11600.0	0.7158	0.7158
1947	11400.0	0.7263	0.7263
1988	11300.0	0.7368	0.7368
1955	10900.0	0.7474	0.7474
1963	10900.0	0.7579	0.7579
1929	10800.0	0.7684	0.7684
1942	10200.0	0.7789	0.7789
1990	10200.0	0.7895	0.7895
1948	9870.0	0.8000	0.8000
1999	9810.0	0.8105	0.8105
1935	9570.0	0.8211	0.8211

1930	9550.0	0.8316	0.8316
1961	9550.0	0.8421	0.8421
1946	9460.0	0.8526	0.8526
1991	9330.0	0.8632	0.8632
1975	9180.0	0.8737	0.8737
2003	9110.0	0.8842	0.8842
1992	8300.0	0.8947	0.8947
1967	7950.0	0.9053	0.9053
1918	7800.0	0.9158	0.9158
1927	7800.0	0.9263	0.9263
1995	6450.0	0.9368	0.9368
1941	6290.0	0.9474	0.9474
1966	6140.0	0.9579	0.9579
1965	5950.0	0.9684	0.9684
1985	5310.0	0.9789	0.9789
1957	4550.0	0.9895	0.9895

End PeakFQ analysis.

Stations processed :	1
Number of errors :	0
Stations skipped :	0
Station years :	94

Data records may have been ignored for the stations listed below.

(Card type must be Y, Z, N, H, I, 2, 3, 4, or *.)

(2, 4, and * records are ignored.)

Maine Department of Transportation

Memo

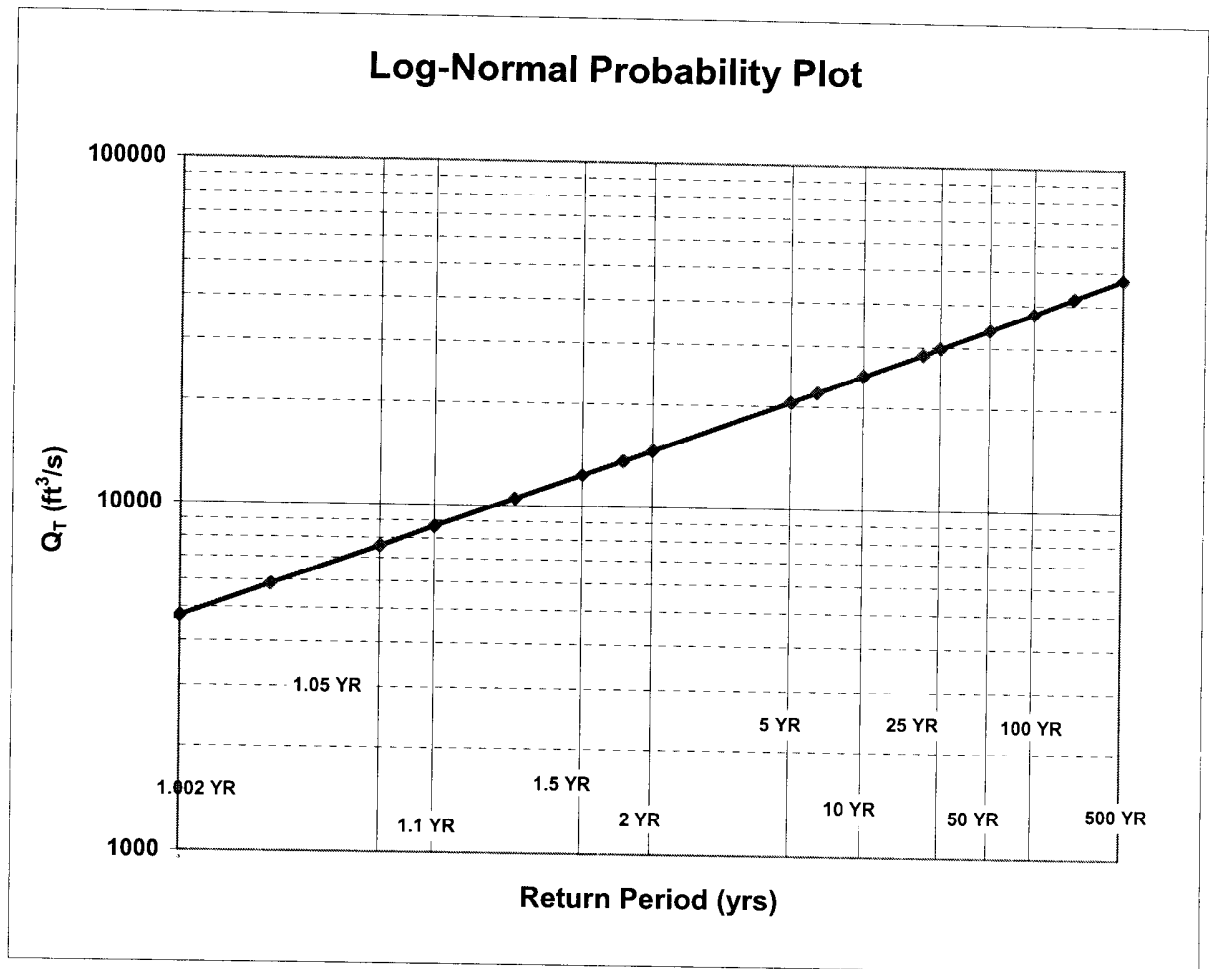
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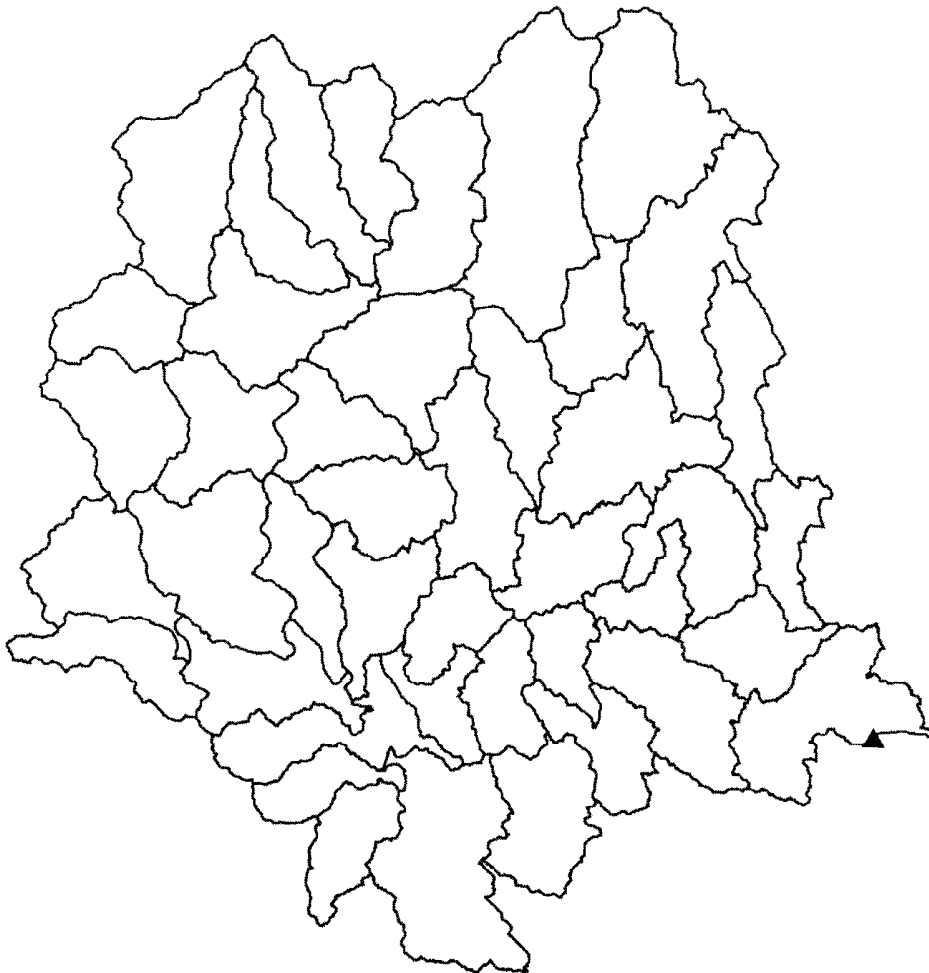
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Figure 2. Saco River Watershed (with Subwatersheds) at Steep Falls Bridge



Appendix: Output for Saco River-Cornish Gage from PeakFQ

Program PeakFq	U. S. GEOLOGICAL SURVEY	Seq.000.000
Ver. 5.2	Annual peak flow frequency analysis	Run Date / Time
11/01/2007	following Bulletin 17-B Guidelines	02/24/2012 13:17

--- PROCESSING OPTIONS ---

Plot option = Graphics device
Basin char output = None
Print option = Yes
Debug print = No
Input peaks listing = Long
Input peaks format = WATSTORE peak file

Input files used:

peaks (ascii)- D:\PROGFILS\PEAKFQ\TEST\DATA_IN\SACO-CORNISH.TXT
specifications - PKFQWPSF.TMP

Output file(s):

main - D:\PROGFILS\PEAKFQ\TEST\DATA_IN\SACO-CORNISH.PRT

Program PeakFq	U. S. GEOLOGICAL SURVEY	Seq.001.001
Ver. 5.2	Annual peak flow frequency analysis	Run Date / Time
11/01/2007	following Bulletin 17-B Guidelines	02/24/2012 13:17

Station - 01066000 Saco River at Cornish, Maine

I N P U T D A T A S U M M A R Y

Number of peaks in record	=	94
Peaks not used in analysis	=	0
Systematic peaks in analysis	=	94
Historic peaks in analysis	=	0
Years of historic record	=	0
Generalized skew	=	0.029
Standard error	=	0.297
Mean Square error	=	0.088
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Gage base discharge	=	0.0
User supplied high outlier threshold	=	--
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11/01/2007	following Bulletin 17-B Guidelines	02/24/2012 13:17

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	FLOOD BASE		LOGARITHMIC		
	EXCEEDANCE		STANDARD		
	DISCHARGE	PROBABILITY	MEAN	DEVIATION	SKEW
SYSTEMATIC RECORD	0.0	1.0000	4.1347	0.1725	0.031
BULL.17B ESTIMATE	0.0	1.0000	4.1347	0.1725	0.030

ANNUAL FREQUENCY CURVE -- DISCHARGES AT SELECTED EXCEEDANCE PROBABILITIES

ANNUAL			'EXPECTED	95-PCT CONFIDENCE LIMITS	
EXCEEDANCE	BULL.17B	SYSTEMATIC	PROBABILITY'	FOR BULL. 17B ESTIMATES	
PROBABILITY	ESTIMATE	RECORD	ESTIMATE	LOWER	UPPER
0.9950	4958.0	4959.0	4828.0	4241.0	5625.0
0.9900	5461.0	5462.0	5348.0	4726.0	6142.0
0.9500	7120.0	7120.0	7049.0	6352.0	7829.0
0.9000	8208.0	8208.0	8156.0	7430.0	8932.0
0.8000	9757.0	9756.0	9725.0	8968.0	10510.0

0.6667	11470.0	11470.0	11460.0	10660.0	12290.0
0.5000	13610.0	13610.0	13610.0	12720.0	14570.0
0.4292	14610.0	14610.0	14620.0	13660.0	15660.0
0.2000	19040.0	19040.0	19100.0	17680.0	20710.0
0.1000	22720.0	22720.0	22860.0	20870.0	25100.0
0.0400	27450.0	27450.0	27770.0	24860.0	30930.0
0.0200	31030.0	31040.0	31550.0	27820.0	35460.0
0.0100	34660.0	34670.0	35430.0	30770.0	40130.0
0.0050	38370.0	38380.0	39450.0	33740.0	44980.0
0.0020	43400.0	43420.0	45020.0	37730.0	51670.0

Program PeakFq	U. S. GEOLOGICAL SURVEY	Seq.001.003
Ver. 5.2	Annual peak flow frequency analysis	Run Date / Time
11/01/2007	following Bulletin 17-B Guidelines	02/24/2012 13:17

Station - 01066000 Saco River at Cornish, Maine

I N P U T D A T A L I S T I N G

WATER YEAR	DISCHARGE	CODES	WATER YEAR	DISCHARGE	CODES
1917	17600.0		1964	13400.0	
1918	7800.0		1965	5950.0	
1919	13500.0		1966	6140.0	
1920	14100.0		1967	7950.0	
1921	12600.0		1968	13800.0	
1922	18000.0		1969	25600.0	
1923	23000.0		1970	15500.0	
1924	12900.0		1971	14500.0	
1925	15900.0		1972	14800.0	
1926	12600.0		1973	17300.0	
1927	7800.0		1974	20000.0	
1928	13600.0		1975	9180.0	
1929	10800.0		1976	19200.0	
1930	9550.0		1977	12900.0	
1931	11700.0		1978	15500.0	
1932	13800.0		1979	18000.0	
1933	19500.0		1980	11800.0	
1934	14200.0		1981	17500.0	

1935	9570.0	1982	15900.0
1936	46600.0	1983	16100.0
1937	16900.0	1984	23300.0
1938	11900.0	1985	5310.0
1939	14100.0	1986	15400.0
1940	21500.0	1987	31300.0
1941	6290.0	1988	11300.0
1942	10200.0	1989	18300.0
1943	11900.0	1990	10200.0
1944	12100.0	1991	9330.0
1945	15800.0	1992	8300.0
1946	9460.0	1993	18200.0
1947	11400.0	1994	14900.0
1948	9870.0	1995	6450.0
1949	12600.0	1996	15400.0
1950	17100.0	1997	14800.0
1951	17100.0	1998	27500.0
1952	16900.0	1999	9810.0
1953	42400.0	2000	12700.0
1954	22800.0	2001	15800.0
1955	10900.0	2002	11700.0
1956	11600.0	2003	9110.0
1957	4550.0	2004	13800.0
1958	20200.0	2005	17100.0
1959	11700.0	2006	14900.0
1960	16800.0	2007	17000.0
1961	9550.0	2008	17700.0
1962	14200.0	2009	14100.0
1963	10900.0	2010	17600.0

Explanation of peak discharge qualification codes

PeakFQ NWIS

CODE	CODE	DEFINITION
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D	3	Dam failure, non-recurrent flow anomaly
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G	8	Discharge greater than stated value
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X	3+8	Both of the above
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L	4	Discharge less than stated value
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K	6 OR C	Known effect of regulation or urbanization
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H	7	Historic peak
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- Minus-flagged discharge -- Not used in computation

-8888.0 -- No discharge value given

- Minus-flagged water year -- Historic peak used in computation

Program PeakFq	U. S. GEOLOGICAL SURVEY	Seq.001.004
Ver. 5.2	Annual peak flow frequency analysis	Run Date / Time
11/01/2007	following Bulletin 17-B Guidelines	02/24/2012 13:17

Station - 01066000 Saco River at Cornish, Maine

EMPIRICAL FREQUENCY CURVES -- WEIBULL PLOTTING POSITIONS

WATER	RANKED	SYSTEMATIC	BULL.17B
YEAR	DISCHARGE	RECORD	ESTIMATE
1936	46600.0	0.0105	0.0105
1953	42400.0	0.0211	0.0211
1987	31300.0	0.0316	0.0316
1998	27500.0	0.0421	0.0421
1969	25600.0	0.0526	0.0526
1984	23300.0	0.0632	0.0632
1923	23000.0	0.0737	0.0737
1954	22800.0	0.0842	0.0842
1940	21500.0	0.0947	0.0947
1958	20200.0	0.1053	0.1053
1974	20000.0	0.1158	0.1158
1933	19500.0	0.1263	0.1263
1976	19200.0	0.1368	0.1368
1989	18300.0	0.1474	0.1474
1993	18200.0	0.1579	0.1579
1922	18000.0	0.1684	0.1684
1979	18000.0	0.1789	0.1789
2008	17700.0	0.1895	0.1895

1917	17600.0	0.2000	0.2000
2010	17600.0	0.2105	0.2105
1981	17500.0	0.2211	0.2211
1973	17300.0	0.2316	0.2316
1950	17100.0	0.2421	0.2421
1951	17100.0	0.2526	0.2526
2005	17100.0	0.2632	0.2632
2007	17000.0	0.2737	0.2737
1937	16900.0	0.2842	0.2842
1952	16900.0	0.2947	0.2947
1960	16800.0	0.3053	0.3053
1983	16100.0	0.3158	0.3158
1925	15900.0	0.3263	0.3263
1982	15900.0	0.3368	0.3368
1945	15800.0	0.3474	0.3474
2001	15800.0	0.3579	0.3579
1970	15500.0	0.3684	0.3684
1978	15500.0	0.3789	0.3789
1986	15400.0	0.3895	0.3895
1996	15400.0	0.4000	0.4000
1994	14900.0	0.4105	0.4105
2006	14900.0	0.4211	0.4211
1972	14800.0	0.4316	0.4316
1997	14800.0	0.4421	0.4421
1971	14500.0	0.4526	0.4526
1934	14200.0	0.4632	0.4632
1962	14200.0	0.4737	0.4737
1920	14100.0	0.4842	0.4842
1939	14100.0	0.4947	0.4947
2009	14100.0	0.5053	0.5053

1932	13800.0	0.5158	0.5158
1968	13800.0	0.5263	0.5263
2004	13800.0	0.5368	0.5368
1928	13600.0	0.5474	0.5474
1919	13500.0	0.5579	0.5579
1964	13400.0	0.5684	0.5684
1924	12900.0	0.5789	0.5789
1977	12900.0	0.5895	0.5895
2000	12700.0	0.6000	0.6000
1921	12600.0	0.6105	0.6105
1926	12600.0	0.6211	0.6211
1949	12600.0	0.6316	0.6316
1944	12100.0	0.6421	0.6421
1938	11900.0	0.6526	0.6526
1943	11900.0	0.6632	0.6632
1980	11800.0	0.6737	0.6737
1931	11700.0	0.6842	0.6842
1959	11700.0	0.6947	0.6947
2002	11700.0	0.7053	0.7053
1956	11600.0	0.7158	0.7158
1947	11400.0	0.7263	0.7263
1988	11300.0	0.7368	0.7368
1955	10900.0	0.7474	0.7474
1963	10900.0	0.7579	0.7579
1929	10800.0	0.7684	0.7684
1942	10200.0	0.7789	0.7789
1990	10200.0	0.7895	0.7895
1948	9870.0	0.8000	0.8000
1999	9810.0	0.8105	0.8105
1935	9570.0	0.8211	0.8211

1930	9550.0	0.8316	0.8316
1961	9550.0	0.8421	0.8421
1946	9460.0	0.8526	0.8526
1991	9330.0	0.8632	0.8632
1975	9180.0	0.8737	0.8737
2003	9110.0	0.8842	0.8842
1992	8300.0	0.8947	0.8947
1967	7950.0	0.9053	0.9053
1918	7800.0	0.9158	0.9158
1927	7800.0	0.9263	0.9263
1995	6450.0	0.9368	0.9368
1941	6290.0	0.9474	0.9474
1966	6140.0	0.9579	0.9579
1965	5950.0	0.9684	0.9684
1985	5310.0	0.9789	0.9789
1957	4550.0	0.9895	0.9895

End PeakFQ analysis.

Stations processed :	1
Number of errors :	0
Stations skipped :	0
Station years :	94

Data records may have been ignored for the stations listed below.

(Card type must be Y, Z, N, H, I, 2, 3, 4, or *.)

(2, 4, and * records are ignored.)